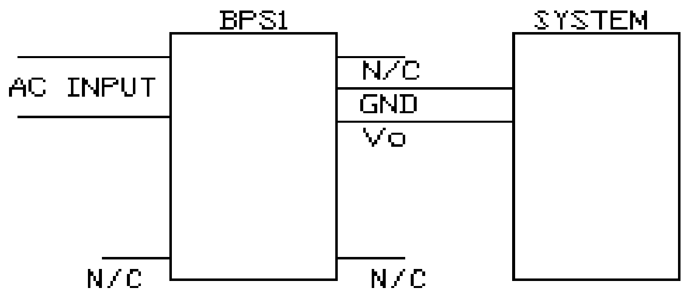
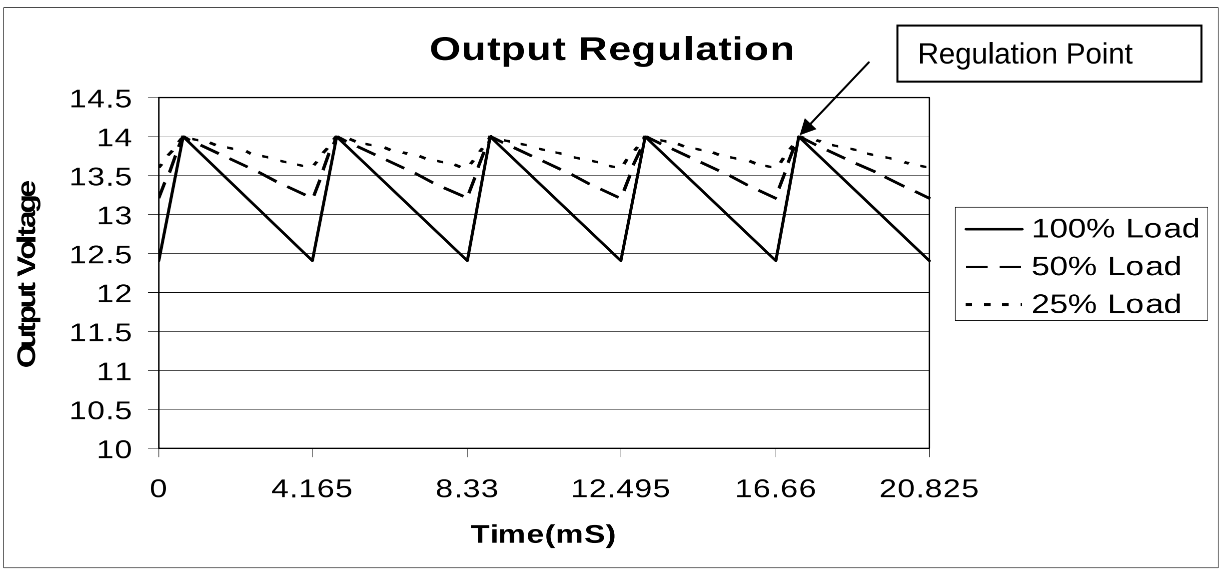
BIAS Power

BPS 1 Series Application Notes

Standard circuit diagram



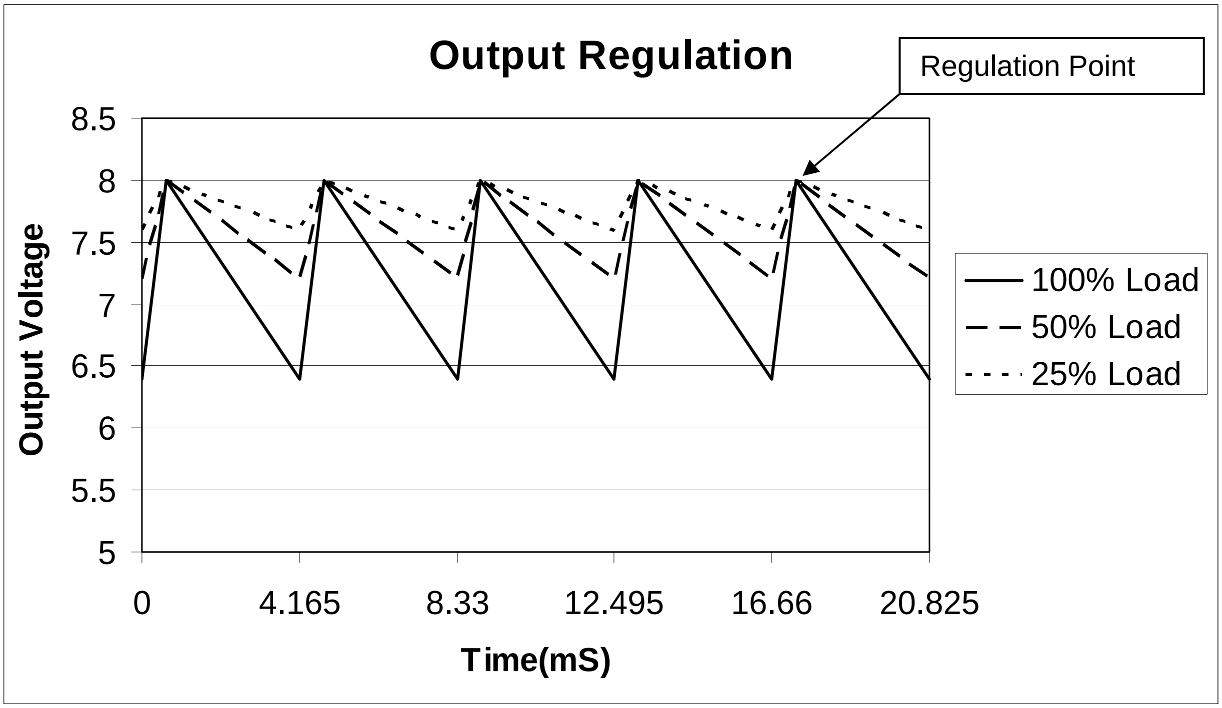


The BPS 1 regulates off of the peak output voltage. Using an oscilloscope is the only way to correctly see the regulation of the unit. When using a multi-meter to measure the output voltage you will see the average of the output voltage, not the actual regulation of the unit.

For Example: When the unit is at full load, the output voltage peak is at 14Vdc, the output voltage minimum is at 12.4Vdc, the multi-meter will read the average of the voltage 13.2Vdc. When the unit is at 25% load, the output voltage peak is still at 14Vdc but the minimum is now at 13.6Vdc, the multi-meter will now read 13.8Vdc.

As you can also see from the graph above and the chart below the output ripple decreases as the output load decreases.

	Vpeak	Vavg	Vmin	Ripple
100% Load	14V	13.2V	12.4V	1.6V
50% Load	14V	13.6V	13.2V	0.8
25% Load	14V	13.8V	13.6V	0.4



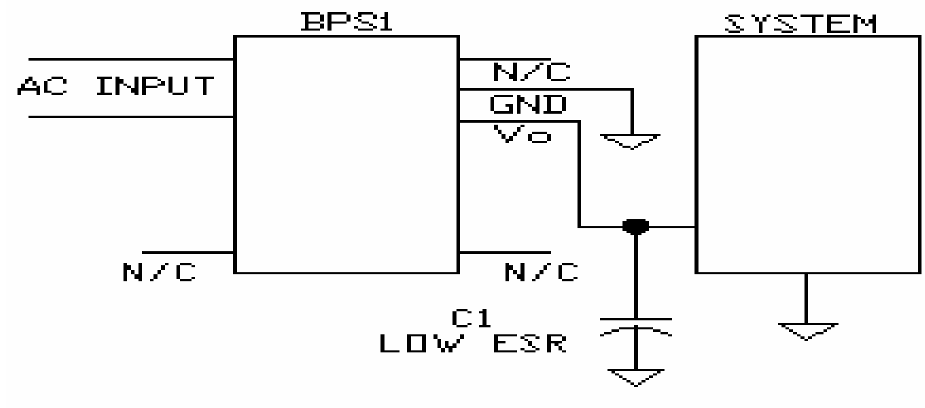
The BPS 1 regulates off of the peak output voltage. Using an oscilloscope is the only way to correctly see the regulation of the unit. When using a multi-meter to measure the output voltage you will see the average of the output voltage, not the actual regulation of the unit.

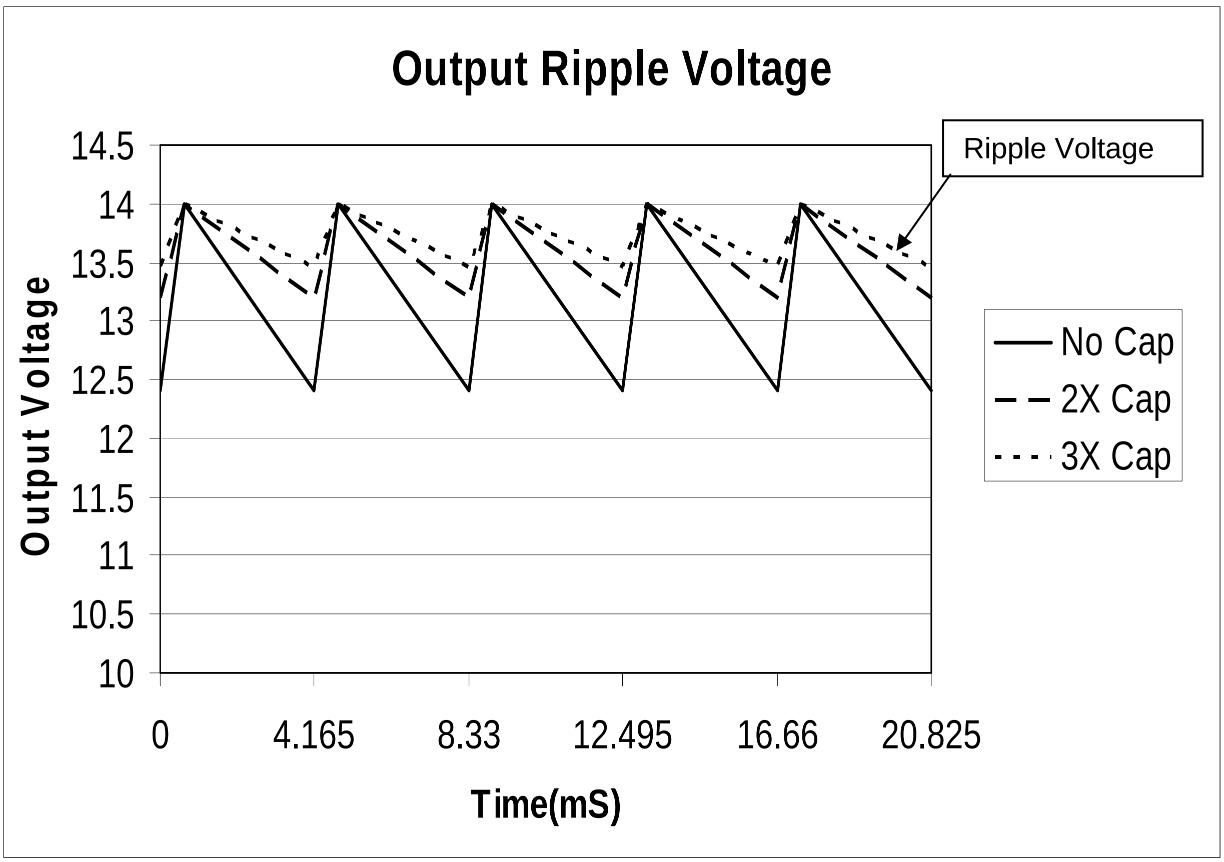
For Example: When the unit is at full load, the output voltage peak is at 8Vdc, the output voltage minimum is at 6.4Vdc, the multi-meter will read the average of the voltage 7.2Vdc. When the unit is at 25% load, the output voltage peak is still at 8Vdc but the minimum is now at 7.6Vdc, the multi-meter will now read 7.8Vdc.

As you can also see from the graph above and the chart below the output ripple decreases as the output load decreases.

	Vpeak	Vavg	Vmin	Ripple
100% Load	8V	7.2V	6.4V	1.6V
50% Load	8V	7.6V	7.2V	0.8
25% Load	8V	7.8V	7.6V	0.4

Reducing output ripple voltage with an external capacitor

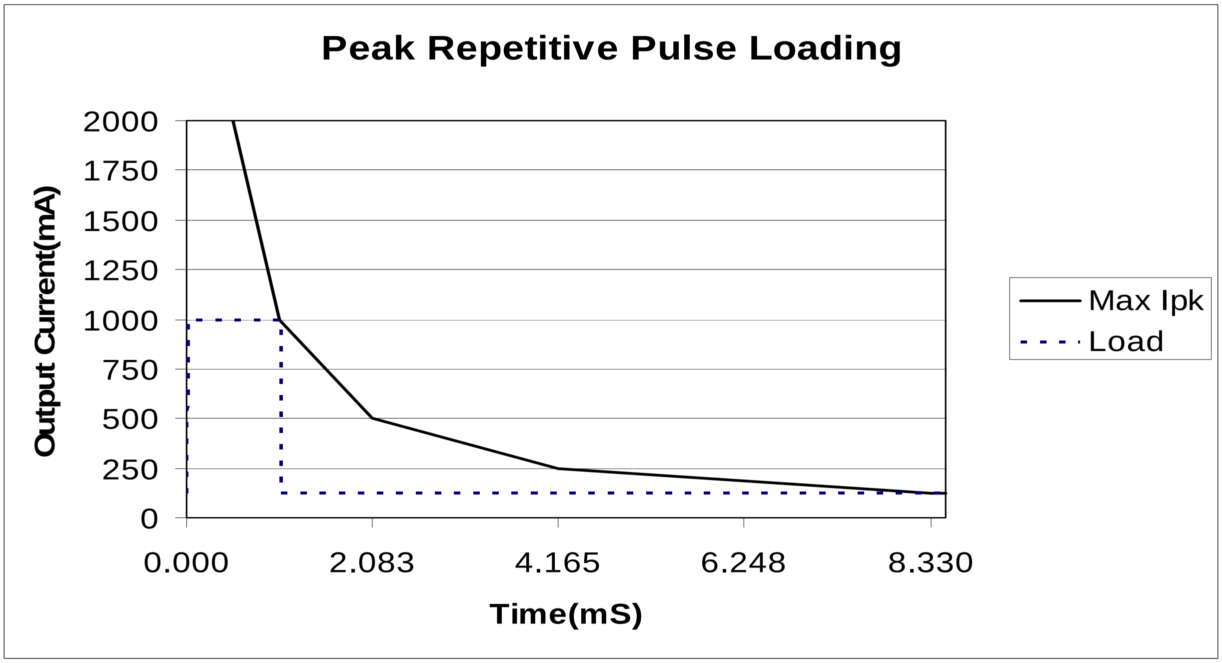




To reduce the output ripple voltage you can add an external electrolytic capacitor across the Vo output. The graph above shows using a 2 times and 3 times external capacitor.

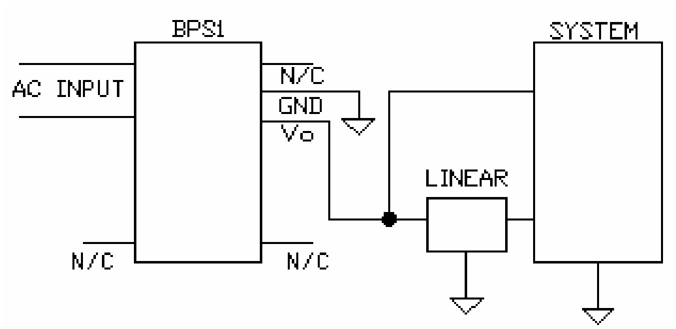
The 14V model has a 470uF internal capacitor and the 8V model has a 680uF internal capacitor. We recommend using a low impedance electrolytic capacitor.

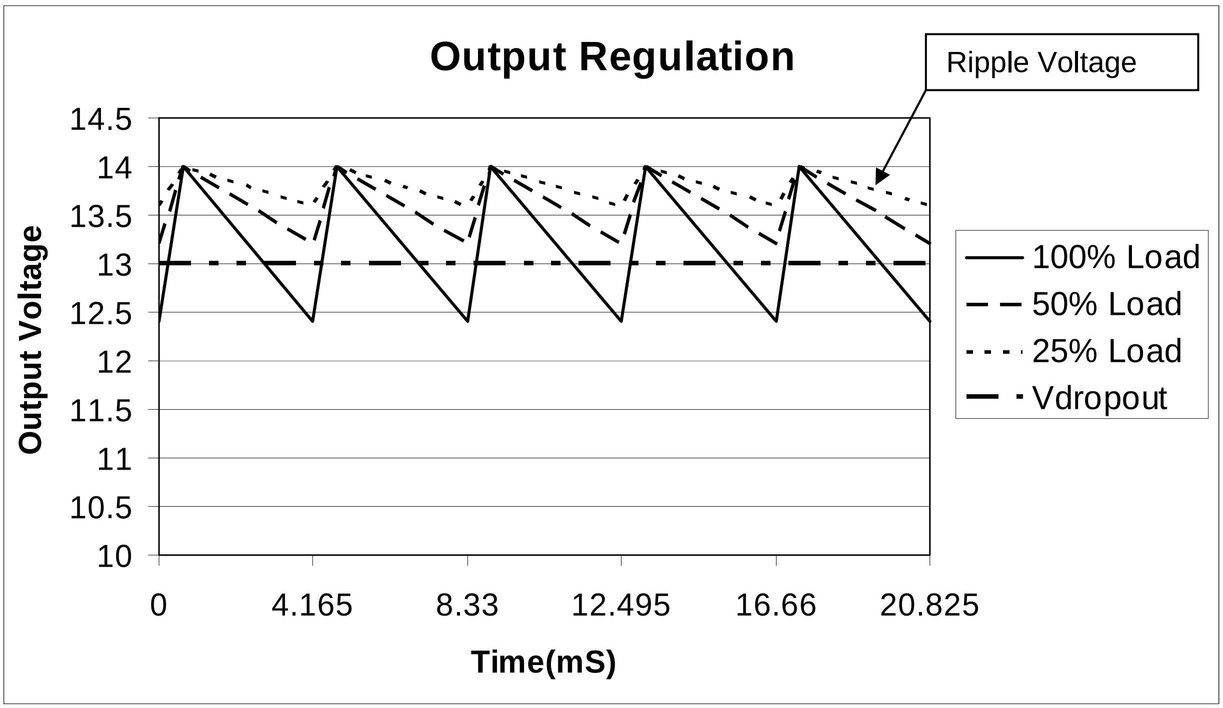
Repetitive Pulse Loading



The above graph illustrates a peak repetitive pulse load on the output of the device. The graph represents a drop in output voltage equal to the output ripple of the device (approximately 1.6V). The load waveform shown on the graph is an example of a peak load of 1A for a maximum time of 1.04mS. The graph on the data sheet shows the curves for both output models.

Using an external linear regulator





BIAS recommends using the LM3480 series linear regulators made by National Semiconductor. These linear regulators have great 100Khz ripple rejection ratios and only have a dropout voltage of 1V typically.

Example 1: BPS 1-14-00 with an external 12V linear regulator

By looking at the graph above you can determine if you need an external electrolytic capacitor on the output of the unit.

For Example: Max load on BPS 1 is 100%, as you can see the minimum voltage would then be 12.4Vdc. Since this is under the dropout voltage of the linear regulator we would need to add an electrolytic capacitor to the Vo output to increase the minimum voltage (See external capacitor application note). If the load is less than 70%, the unit would work without any external capacitor.

Now lets check the power dissipation on the linear regulator.

Pdiss = (Vavg – Vlinoutput) * Iout

Pdiss = (13.5 – 12) * 50 mA

Pdiss = 75 mW

The SOT-23 package linear regulator is good for 225 mW so this is acceptable.

The 50 mAmps above is 70% load on the BPS1.

Example 2: BPS 1-14-00 with a 5V linear regulator

Clearly the minimum output voltage is way above the dropout voltage of the linear regulator. So in this case we would be concerned about the maximum power being dissipated by the linear regulator.

Again using the LM3480 SOT-23 linear regulator to determine the maximum allowable output current.

Just for grins let's check the power dissipation on the linear regulator with 100% loading on the output.

Pdiss = (Vavg – Vlinoutput) * Iout

Pdiss = (13.2 – 5) * 71 mA

Pdiss = 582 mW

This is way over the rating for the SOT-23 package linear regulator, so now we can calculate the max Iout for this package device.

Ioutmax = Pdiss / (Vavg- Vlinoutput)

Ioutmax = 0.225 W / (13.2 – 5)

Ioutmax = 27 mAmax

Below is how to calculate how much current you can use out of the Vo output while using the regulator output as well.

We will use the above example to calculate this.

Vo Iout max = (Po / Vo)

Po for the BPS1 series is 1W, Vo is 14V for this model.

Vo Iout max = (1 / 14) = 71.4 mAmps

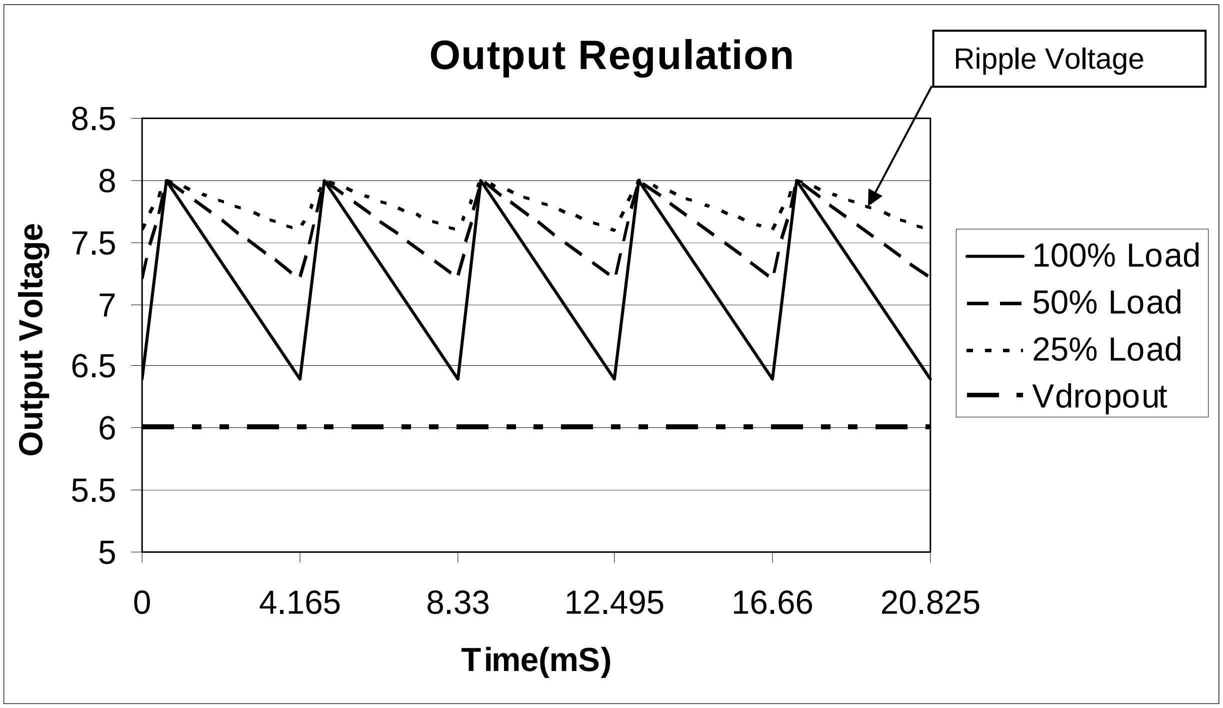
As shown above we are going to use a maximum of 27 mAmps through the linear regulator output.

Vo Iout Leftover = (Vo Iout max – Vlin Iout max)

Vo Iout Leftover = (71.4mA – 27mA)

Vo iout Leftover = 44.4mAmps

This 44.4mAmps of current can be drawn from the 14V output at the same time as the 27mAmps is being consumed on the linear regulator output.



Example 3: <u>BPS 1 – 08-00 with a 5V linear regulator</u>

As shown by the graph, even if we use 100% loading on the unit, the minimum voltage is still above the dropout voltage of the linear regulator. In this case there would be no reason for an external capacitor.

Now lets check the power dissipation on the linear regulator.

Pdiss = (Vavg – Vlinoutput) * Iout

Pdiss = (7.2 – 5) * 125mA

Pdiss = 275 mW

This is over the rating for the SOT-23 package linear regulator, so now we can calculate the max Iout for this package device.

Ioutmax = Pdiss / (Vavg- Vlinoutput)

Ioutmax = 0.225w / (7.2 – 5)

Ioutmax = 102 mAmax

Below is how to calculate how much current you can use out of the Vo output while using the regulator output as well.

We will use the above example to calculate this.

Vo Iout max = (Po / Vo)

Po for the BPS 1 series is 1W, Vo is 8V for this model.

Vo Iout max = (1 / 8) = 125 mAmps

As shown above we are going to use a maximum of 102 mAmps through the linear regulator output.

Vo Iout Leftover = (Vo Iout max – Vlin Iout max)

Vo Iout Leftover = (125 mA – 102 mA)

Vo iout Leftover = 23 mAmps

This 23 mAmps of current can be drawn from the 8V output at the same time as the 102 mAmps is being consumed on the linear regulator output.